What is claimed is:

1. A conductive concrete mixture for use in a bridge deck system comprising: cement; aggregate; water; and conductive materials, wherein said conductive materials include metal fibers and metal particles.

2. The mixture of claim 1 wherein said metal fibers comprise 1-3% of the total volume of conductive concrete mixture and said metal particles comprise 5-40% of the total volume of conductive concrete mixture.

3. The mixture of claim 2 wherein said metal fibers comprise 1-2% of the total volume of conductive concrete mixture and said metal particles comprise 10-30% of the total volume of conductive concrete mixture.

4. The mixture of claim 3 wherein said metal fibers comprise 1.5% of the total volume of conductive concrete mixture and said metal particles comprise 20% of the total volume of conductive concrete mixture.

5. The mixture of claim 4 wherein electrodes are embedded therein at spaced locations.

6. The mixture of claim 5 wherein said electrodes are spaced four to six feet apart.

7. A method of making conductive concrete comprising: loading coarse aggregate onto a conveyer; loading metal particles onto said conveyer; thereafter placing metal fibers onto said conveyer wherein the contents of said conveyer then are emptied into a container containing cement in water; and mixing said coarse aggregate, metal particles, metal fibers and cement in water in said container.

8. A heating system for a bridge deck comprising: a photovoltaic cell; an energy storage device electrically coupled to said photovoltaic cell; and conductive concrete forming at least a portion of the bridge deck and being electrically coupled to said energy storage device; wherein said conductive concrete includes metal fibers and metal particles.

9. The heating system of claim 8 wherein said energy storage device is a bank of one or more batteries.

10. The heating system of claim 9 wherein said power system further comprises an inverter and a step-up transformer.

11. A heating system for a bridge deck comprising: conductive concrete forming at least a portion of the bridge deck; wherein said conductive concrete includes metal fibers and metal particles; a power source electrically coupled to said conductive concrete; a control unit for turning said power supply on and off; a temperature sensor electrically coupled to said controller; and a moisture sensor electrically coupled to said controller; wherein said control unit is turned on or off upon sensing particular temperature and moisture levels.

12. The heating system of claim 11 wherein there are at least two temperature sensors, one for sensing air temperature and one for sensing the surface temperature of the conductive concrete.

13. The heating system of claim 12 wherein said power source is an alternate current power source.

14. Electrodes for use in a conductive concrete bridge deck system comprising: two parallel plate portions; and at least one intermediate section, said parallel plate portions and said intermediate section forming at least one void therebetween through which conductive concrete may flow; wherein said electrodes are embedded in the conductive concrete at spaced locations.

15. The electrodes of claim 14 wherein said parallel plate portions and said intermediate section are formed as part of a single metal plate.

16. The electrodes of claim 15 wherein said intermediate sections are formed by attaching elongated rod structures to said parallel plate portions at spaced locations.

17. The electrodes of claim 16 wherein said parallel plate portions are formed from corrugated metal.

18. A heating system for a bridge deck comprising: a first layer; a second layer made of an electrically conductive material situated atop said first layer; and means for applying an electrical current to said second layer; wherein said second layer comprises a cementitious composite admixed with a plurality of electrically conductive components; and wherein said electrically conductive components are metal particles and metal fibers.

19. The heating system of claim 18 wherein said means to apply an electrical current comprises a power source capable of applying an electrical current to a planar surface of said second layer sufficient to heat said planar surface to a temperature greater than 0 °C.

20. The heating system of claim 19 wherein said means to apply an electrical current comprises a power source capable of applying an average electrical power of 500-600 $W/m^2$ to said electrically conductive material.

21. The heating system of claim 19 wherein said power source is a direct current power source.

22. The heating system of claim 19 wherein said power source is an alternate current power source.

23. The heating system of claim 19 wherein said power source is a photovoltaic power source.

24. The heating system of claim 20 wherein said power source is a direct current power source.

25. The heating system of claim 20 wherein said power source is an alternate current power source.

26. The heating system of claim 20 wherein said power source is a photovoltaic power source.

27. A heating system for a bridge deck comprising: a first layer; a second layer made of an electrically conductive material situated atop said first layer; a thermal insulating layer disposed between said first layer and said second layer; and means for applying an electrical current to said second layer.

28. The heating system of claim 27 wherein said second layer comprises a cementitious composite admixed with a plurality of electrically conductive components.

29. The heating system of claim 28 wherein said plurality of electrically conductive components are metal particles and metal fibers.

30. The heating system of claim 29 wherein said means to apply an electrical current comprises a power source capable of applying an electrical current to a planar surface of said second layer sufficient to heat said planar surface to a temperature greater than 0°C.

31. The heating system of claim 30 wherein said means to apply an electrical current comprises a power source capable of applying an average electrical power of 500-600 $W/m^2$ to said electrically conductive material.

32. The heating system of claim 30 wherein said power source is a direct current power source.

33. The heating system of claim 30 wherein said power source is an alternate current power source.

34. The heating system of claim 30 wherein said power source is a photovoltaic power source.

35. The heating system of claim 31 wherein said power source is a direct current power source.

36. The heating system of claim 31 wherein said power source is an alternate current power source.

37. The heating system of claim 31 wherein said power source is a photovoltaic power source.

38. A system to melt ice and snow accumulation from a bridge deck comprising: a first layer; a second layer made of an electrically conductive material situated atop said first layer; and means for applying a radio frequency across said second layer sufficient to create microwave heating of said ice and snow accumulation atop said second layer.

39. The system of claim 38 wherein a thermal insulating layer is applied between said first layer and said second layer.

40. A method to apply a conductive concrete surface capable of melting ice and snow accumulation from the surface thereof, comprising: applying a layer of electrically conductive material on top of an existing layer; and applying means whereby an electrical current can be applied to said layer of electrically conductive material, wherein said layer of electrically conductive material comprises a cementitious composite admixed with a plurality of electrically conductive components, and wherein said electrically conductive components include metal fibers and metal particles.

41. The method of claim 40 wherein a thermal insulation layer is applied between said existing layer and said layer of electrically conductive material.

42. A method to apply a conductive concrete surface capable of melting ice and snow accumulation from the surface thereof, comprising: applying a layer of electrically conductive material on top of an existing layer; and applying means whereby a radio frequency can be directed to said electrically conductive material.

43. The method of claim 42 wherein a thermal insulation layer is applied between said existing layer and said layer of electrically conductive material.

44. The method of claim 43 wherein said electrically conductive material comprises a cementitious composite admixed with a plurality of electrically conductive components.

45. An insulating material, comprising: between 50 to 99 percent mortar by volume; and between 1 to 50 percent sawdust by volume.